WHAT IS CLAIMED IS:

1.   A method of backup and restore procedure using a first storage
subsystem and second storage subsystem which are connected to each other via a path,
the first storage subsystem connected to a first host, the second storage subsystem
connected to a second host, the method comprising the steps of:

performing a backup procedure comprising the steps of:

providing a first logical volume to the first storage subsystem and a
second logical volume and a third logical volume in the second storage subsystem, the
second logical volume being a copied logical volume of the first logical volume, the first
and second logical volumes being in sync state, the third logical volume being a copied
logical volume of the second logical volume, the second and third logical volumes being
in sync state; and

splitting the second logical volume and the third logical volume
from the first host by a command from the first storage subsystem; and

performing a restore procedure comprising the steps of :

mounting the third logical volume to the second host,

reading, at the second host, a file to be restored from the third
volume,

writing, at the second host, the file to the second volume, and

re-synchronizing the first volume with the second volume.

2.   The method of claim 1, wherein
performing a restore procedure further comprises:

recovering a database onto the first volume, if a database application is
being run on the first host.

3.   The method of claim 1, wherein
re-synchronizing the first volume with the second volume
further comprises:

determining from a pending data bitmap data on the second volume to be
copied to the primary volume.

1   4.   The method of claim 1, further comprising

2   marking write data arriving after the command in a pending data bitmap,

3   thereby tracking which data has been modified.

1   5.   The method of claim 1, wherein

2   the command comprises identities of one or more files to be restored from

3   the third volume and written to the second volume, and wherein

4   reading, at the second host, a file to be restored from the third volume and

5   writing, at the second host, the file to the second volume,

6   further comprises:

7   reading exclusively the files specified in the command from the third

8   volume and writing the files so read to the second volume.

1   6.   A method, comprising:

2   receiving an indication of files to be restored;

3   determining whether the files to be restored comprise contents of an entire

4   volume, and if so:

5   splitting remote mirrors existing between the production volumes and

6   backup volumes;

7   resynchronizing local mirrors existing between the backup volumes and

8   volumes holding data copied from the backup volumes; and

9   resynchronizing remote mirrors for the production volumes and the backup

10 volumes.

1   7.   The method of claim 6, wherein

2   resynchronizing local mirrors existing between the backup volumes and

3   volumes holding data copied from the backup volumes comprises:

4   comparing a pending bitmap for the backup volume with a pending bitmap

5   for the volume holding data copied from the backup volume to determine a set of

6   differential data; and

7   copying the differential data from the volume holding data copied from

8   the backup volume to the backup volume.

1   8.   The method of claim 6, wherein

2   resynchronizing remote mirrors for the production volumes and the backup

3 volumes comprises:

4   comparing a pending bitmap for the production volume with a pending

5 bitmap for the backup volume to determine a set of differential data; and

6   copying the differential data from the backup volume to the production

7 volume.

1   9.   An apparatus, comprising:

2   means for receiving an indication of files to be restored;

3   means for determining whether the files to restore comprise contents of an

4 entire volume;

5   means for splitting remote mirrors existing between the production

6 volumes and backup volumes;

7   means for resynchronizing local mirrors existing between the backup

8 volumes and volumes holding data copied from the backup volumes; and

9   means for resynchronizing remote mirrors for the production volumes and

10 the backup volumes.

1   10.   A method of restoring a file to a first storage subsystem connected

2 to a first host from a second storage subsystem connected to a second host, in accordance

3 with a request from the first host, wherein:

4   the first storage subsystem and second storage subsystem are connected

5 each other via a path, the first storage subsystem stores a first logical volume, the second

6 storage subsystem stores a second logical volume and a third logical volume, the second

7 logical volume being a copied logical volume of the first logical volume, the third logical

8 volume being a copied logical volume of the second logical volume, the first logical

9 volume and the second logical volume being in a non-sync state, the second and third

10 logical volumes being in sync state,

11   the method comprising:

12   mounting the third logical volume to the second host,

13   reading, at the second host, a file to be restored from the third

14   volume and

15   writing, at the second host, the file to the second volume, and

16   re-synchronizing the first volume with the second volume.

1   11.   The method of claim 10, wherein:

2   mounting the third logical volume to the second host comprises:

3   responsive to a command, splitting the sync state between the second

4   logical volume and the third logical volume.

1   12.   A storage subsystem, comprising:

2   a first logical volume,

3   a second logical volume, and

4   an interface to a path providing connectivity to a primary storage

5   subsystem,

6   the second logical volume being a copied logical volume of the first

7   logical volume,

8   the first logical volume operative to be selectively placed into one of a

9   sync state and a non-sync state with a logical volume in a primary storage subsystem,

10   the first logical volume and second logical volume being in sync state,

11   the second logical volume operative to permit host access to read files to

12   be restored from the second logical volume and write the files to be restored to the first

13   logical volume responsive to a restore command, and

14   the second storage subsystem operative to establish a sync state between

15   the first logical volume and the second logical volume.

1   13.   A computer program product, comprising:

2   code for receiving an indication of files to be restored;

3   code for determining whether the files to be restored comprise contents of

4   an entire volume, and if so invoking a plurality of codes, comprising:

5   code for splitting remote mirrors existing between the production volumes

6   and backup volumes;

7   code for resynchronizing local mirrors existing between the backup

8   volumes and volumes holding data copied from the backup volumes;

9   code for resynchronizing remote mirrors for the production volumes and

10   the backup volumes; and

11   a computer readable storage medium that holds the codes.

1   14.   A restored volume produced according to the method of claim 1.

1   15.   A restored volume produced according to the method of claim 10.

1   16.   An apparatus, comprising:

2   means for receiving a command;

3   means for splitting a sync state existing between a second storage means

4   and a third storage means;

5   means for making information on the third storage means available for

6   reading;

7   means for reading a file to be restored from the third storage means;

8   means for writing the file to the second storage means; and

9   means for re-synchronizing the second storage means with a first storage

10   means.

1   17.   The apparatus of claim 16, wherein

2   means for making information on the third storage means available for

3   reading further comprises means for mounting the third storage means to a means for

4   processing information stored by the third storage means.

1   18.   A computer program product, comprising:

2   code for receiving a command;

3   code for splitting a sync state existing between a second storage unit and a

4   third storage unit;

5   code for making information on the third storage unit available for

6   reading;

7   code for reading a file to be restored from the third storage unit;

8   code for writing the file to the second storage unit;

9   code for re-synchronizing the second storage unit with a first storage unit;

10   and

11   a computer program product that holds the codes.

1   19.   A system, comprising:

2   a first storage subsystem connected to a first host,

3   a second storage subsystem connected to a second host, wherein:

4   the first storage subsystem and the second storage subsystem are

5   connected to each other via a path, the first storage subsystem stores a first logical

6   volume, the second storage subsystem stores a second logical volume and a third logical

7   volume, the second logical volume being a copied logical volume of the first logical

8   volume, the third logical volume being a copied logical volume of the second logical

9   volume, the first logical volume and the second logical volume being in a non-sync state,

10   the second and third logical volumes being in sync state, the second storage subsystem

11   operative to mount the third logical volume to the second host responsive to a restore

12   command, the host operative to read files to be restored from the third volume and write

13   the files to be restored to the second volume, and the second storage subsystem operative

14   to establish a sync state between the first logical volume and the second logical volume.

1   20.   The system of claim 19, further comprising:

2   a third storage subsystem, comprising:

3   a fourth storage volume, which is at least sometimes in a sync state with a

4   fifth volume of the second storage subsystem, the sync state enabling data at the first

5   storage subsystem and the third storage subsystem to be collected at the second storage

6   subsystem.

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